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Huneckia pollinii and *Flavoplaca oasis* newly recorded from China

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Abstract—*Huneckia pollinii* and *Flavoplaca oasis* are described and illustrated from Chinese specimens. The two species and the genus *Huneckia* are recorded for the first time from China.

Keywords—Asia, lichens, taxonomy, *Teloschistaceae*

Introduction

Teloschistaceae Zahlbr. is one of the larger families of lichenized fungi. It includes three subfamilies, *Caloplacoideae*, *Teloschistoideae*, and *Xanthorioideae* (Gaya et al. 2012; Arup et al. 2013). Many new genera have been proposed based on molecular phylogenetic investigations (Arup et al. 2013; Fedorenko et al. 2012; Gaya et al. 2012; Kondratyuk et al. 2013, 2014a,b, 2015a,b,c,d). Currently, the family contains approximately 79 genera (Kärnefelt 1989; Arup et al. 2013; Kondratyuk et al. 2013, 2014a,b, 2015a,b,c,d; Søchting et al. 2014a,b).

Huneckia S.Y. Kondr. et al. was described in 2014 (Kondratyuk et al. 2014a) based on morphological, anatomical, chemical, and molecular data. It is characterized by continuous to areolate thalli, paraplectenchymatous cortical

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layers, biatorine apothecia, *Blastenia*-type true exciples, narrowly bacilliform conidia, and the presence of chrysophanol, rhein, and chrysophanal. *Huneckia* is similar to *Blastenia* A. Massal. but differs by having ascospores with very thick cell walls at the poles and in the secondary chemistry (Kondratyuk et al. 2014a). *Huneckia* includes two species, *H. pollinii* and *H. rheinigera* (Elix & S.Y. Kondr.) S.Y. Kondr et al. (Kondratyuk et al. 2014a). No species of *Huneckia* have been reported from China .

Flavoplaca Arup et al., described in 2013 (Arup et al. 2013), is characterized by yellow crustose or squamulose thalli, orange zeorine apothecia, polaribilocular spores with medium to long spore septa, and bacilliform to ellipsoid conidia. The genus is rather similar to *Xanthoria* (Fr.) Th. Fr. and *Caloplaca* Th. Fr. in some characters, but forms a very well delimited clade with many species that are often sorediate. *Flavoplaca* includes about 27 species (Arup et al. 2013).

During our research on the taxa of *Teloschistaceae* in China, we identified two species as new to the country: *Huneckia pollinii* and *Flavoplaca oasis*.

Materials & methods

The specimens, which were collected in Guizhou Province and Inner Mongolia, are preserved in the Lichen Section of the Botanical Herbarium, Shandong Normal University, Jinan, China (SDNU) and the Lichens Research Center in Arid Zones of Northwestern China, Xinjiang University, Wulumuqi, China (XJU). The morphological and anatomical characters were examined under a COIC XTL7045B2 stereo microscope and an Olympus CX41 polarizing microscope. Thalli and medullae were tested with K (10% aqueous solution of potassium hydroxide) and C (a saturated solution of aqueous sodium hypochlorite) for identification. Calcareous and non-calcareous rocks were determined by application of concentrated HCl. The lichen substances were identified using standardized thin layer chromatography techniques (TLC) with solvent system C (Orange et al. 2010). Photos were taken using Olympus SZX16 stereo and BX61 research microscopes attached to an Olympus DP72 camera.

Taxonomic descriptions

Huneckia pollinii (A. Massal.) S.Y. Kondr., Kärnefelt, A. Thell, Elix, Jung Kim, A.S. Kondr. & Hur, Acta Bot. Hung. 56: 111 (2014). Fig. 1

Morphology—Thallus crustose, continuous, very thin to areolate at margin, grey to whitish grey. Apothecia biatorine, sessile, 0.3–1.0 mm diam.; disc dark brown to rust-brown; proper exciple consisting of radiating, thick walled long-septate cells, prosoplectenchymatous; exciple and epithecium K+ reddish violet; without crystals; epihymenium brown; hymenium colourless to pale brown, 74–90 μm high; hypothecium sand yellow, roundish to irregular shape, without oil droplets; paraphyses 2.2–3.0 μm wide, upper part

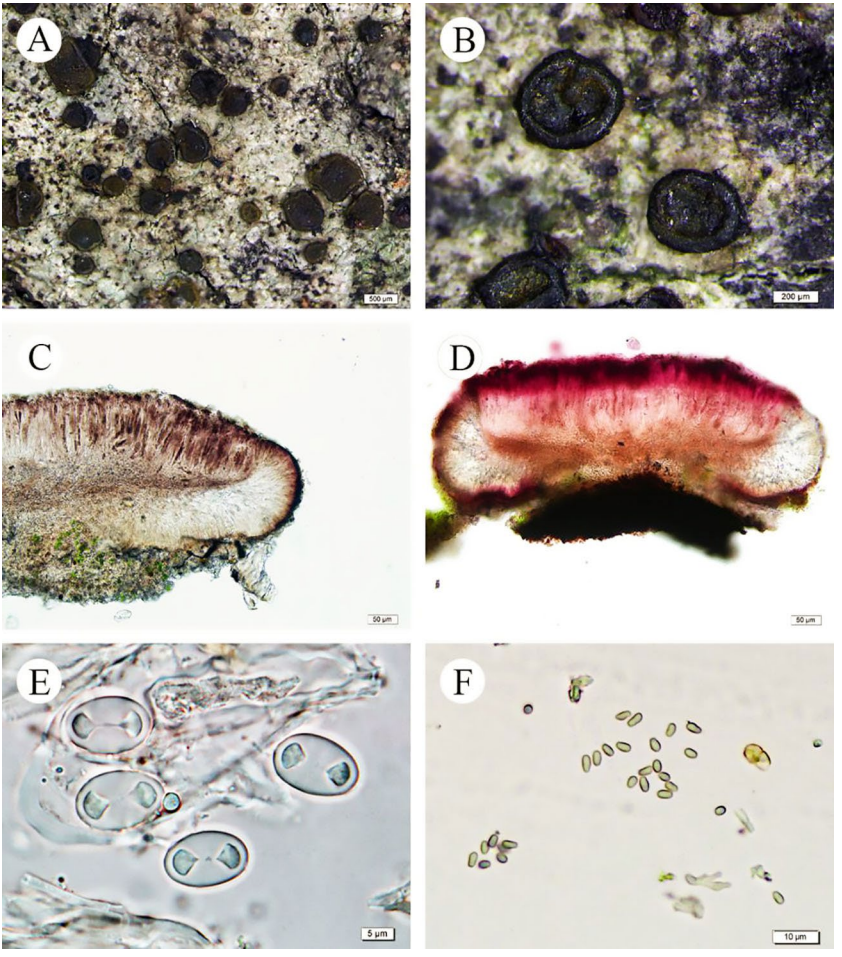

Fig. 1. *Huneckia pollinii* (SDNU 20160195). A: thallus; B: apothecia; C: apothecium section; D: strong red turning to purple K reaction of epihymenium; E: ascospores; F: conidia.

pigmented, without swollen tip, abundantly branching at tips. Asci 8-spored, *Teloschistes*-type; ascospores polaribilocular, ellipsoid, mostly "sand-clock"-shaped; 13.2–19 × 7.5–9.6 µm, with cell walls 1–2(–2.5) µm thick (thickest at the poles); spore septum 2.9–5.7 µm. Conidia elliptical to narrowly bacilliform, 1.5–2.2 × 3.8–5.1 µm.

Chemistry—Thallus and medulla K–, C–. Apothecia K+ purple, C+ red. Epihymenium K+ strong red, turning purple with coloured solution. Unknown substances 1 & 2 (TLC solvent system C Rf. 48 and Rf. 53).

Substrate—On wood or on smooth bark.

Distribution—*Huneckia pollinii* has been reported from the eastern United States, Europe, and Mexico (Wetmore 1994, Kondratyuk et al. 2014a). New to China.

Specimens examined: **CHINA**. **Guizhou**, Dejiang, Quankou town alt. 873 m, on bark, 2 June 2016, X.X. Zhao 20160195, 20160180 (SDNU).

Comments—*Caloplaca pollinii* var. *major* B. de Lesd. is similar to *Huneckia pollinii*, but differs in having concave brown young apothecia, black immarginate older apothecia, and larger spores (Bouly de Lesdain 1949). Specimens of *Caloplaca asserigena* (J. Lahm) Della Torre & Sarnth. that may be confused with *Huneckia pollinii*, can be distinguished by rust-red to red-brown discs and smaller ascospores.

Flavoplaca oasis (A. Massal.) Arup, Frödén & Søchting, Nordic J. Bot. 31: 46 (2013). Fig. 2

Morphology—Thallus usually visible but thin, with only some small granules or areole visible at thallus margin, pale yellow; alveolate cortex; algal layer always separated by fungal hyphae; without prothallus and vegetative propagules; isidia, soredia, and blastidia absent; medulla white. Apothecia pseudolecanorine or zeorine type, abundant, sessile, round or elliptical, 0.1–0.5 mm diam.; disc slightly convex, orange to dark orange, epruinose; proper margin very thin, slightly raised, paler than disc; amphithecium ± reduced, with numerous algae, cortex poorly developed; epihymenium granular, yellow; hymenium hyaline, 75–85 μm tall; paraphyses simple or slightly branched above, 1–2 apical cells thickened, up to 7 μm wide; hypothecium hyaline or inspersed, ±roundish, consisting of thin-walled roundish cells, 53–125 μm, without crystals or oil droplets, prosoplectenchymatous, hyphae irregular, 40–50 μm high. Exciple consisting of thin-walled oval to polygone cells, upper side 38–50 μm. Paraphysis mostly simple, rarely forked, swollen in and near the tip cells, 4.5–5.3 μm in wide. Asci 43–52 × 11–21 μm, 8-spored, *Teloschistes*-type. Ascospores polaribilocular, thin-walled, 8.5–13.5 × (4.0–)4.8–7.6 μm, spore septum wide, >¼ of spore length, 2.9–4.6 μm. Pycnidia not observed.

Chemistry—Thallus K+ purple, medulla K–, epihymenium K+ purple. Unknown substance (TLC solvent system C Rf. 51).

Substrate—On pure limestone, concrete.

Distribution—*Flavoplaca oasis*, which is widespread in Europe (Arup 2009), is also reported from western Asia (John et al. 2004) and North Africa

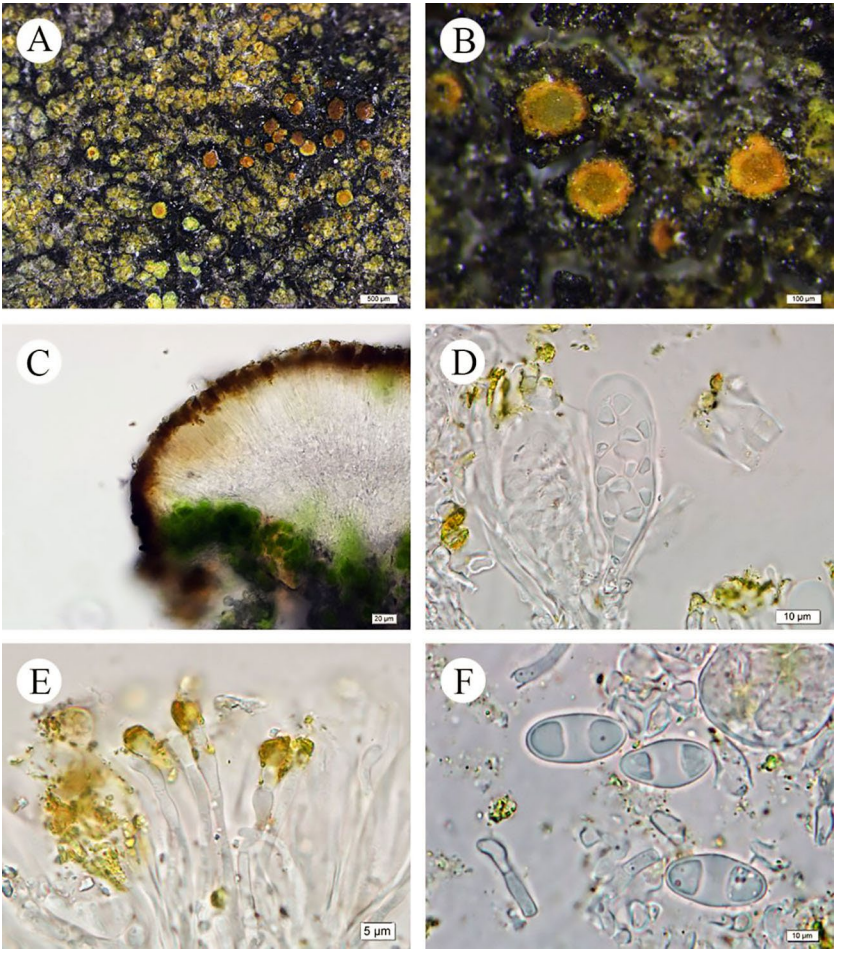

Fig. 2. *Flavoplaca oasis* (SDNU 20160086). A: thallus; B: apothecia; C: apothecium section; D: ascus and ascospores; E: paraphyses; F: ascospores.

(Thor & Nascimbene 2010). The species grows mainly on pure limestone, concrete, and mortar (Arup 2009), where it occurs as a free living or parasitic lichen growing on endolithic *Verrucaria* s.lat. (Wilk 2011). New to China.

Specimens examined: **China**. **Guizhou**, Dejiang, Jingangling, alt. 1100 m, on rocks, 26 May 2016, W.C. Wang , X.X. Zhao 20160086, 20160038, 20160814 (SDNU). **Inner Mongolia**, Daqing mountain, 41°54.60′N 111°47.71′E. alt. 1970 m, on rocks, 12 August 2014. 20141175-b (XJU).

Comments—*Flavoplaca oasis* is similar to *Athallia holocarpa* (Hoffm.) Arup et al., which is distinguished by its more yellow-tinged apothecia with thicker and more prominent proper margins and spores with a broader isthmus. Specimens of *F. oasis* may also be confused with *F. polycarpa* (A. Massal.) Arup et al., which can be distinguished by larger apothecia with thicker margins and more distinct, thicker orange thalli.

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Literature cited

Arup U. 2009. The *Caloplaca holocarpa* group in the Nordic countries, except Iceland. Lichenologist 41: 111–130. https://doi.org/10.1017/S0024282909008135

Arup U, Søchting U, Frödén P. 2013. A new taxonomy of the family *Teloschistaceae*. Nordic Journal of Botany 31: 16–83. https://doi.org/10.1111/j.1756-1051.2013.00062.x

Bouly De Lesdain M. 1949. Notes lichénologiques, N° XXXV. Bulletin de la Société Botanique de France 96(7–9): 173–175. https://doi.org/10.1080/00378941.1949.10837606

Fedorenko NM, Stenroos S, Thell A, Kärnefelt I, Elix JA, Hur JS, Kondratyuk SY. 2012. Molecular phylogeny of xanthorioid lichens (*Teloschistaceae*, *Ascomycota*), with notes on their morphology. Bibliotheca Lichenologica 108: 45–64.

Gaya E, Högnabba F, Holguin Á, Molnár K, Fernández-Brime S, Stenroos S, Arup U, Søchting U, Van den Boom P, Lücking R, Sipman HJM, Lutzoni F. 2012. Implementing a cumulative supermatrix approach for a comprehensive phylogenetic study of the *Teloschistales* (*Pezizomycotina*, *Ascomycota*). Molecular Phylogenetics and Evolution 63: 374–387. https://doi.org/10.1016/j.ympev.2012.01.012

John V, Seaward MRD, Sipman HJM, Zedda L. 2004. Lichens and lichenicolous fungi from Syria, including a first checklist. Herzogia 17: 157–177.

Kärnefelt I. 1989. Morphology and phylogeny in the *Teloschistales*. Cryptogamic Botany 1: 147–203.

Kondratyuk SY, Lőkös L, Tschabanenko S, Haji Moniri M, Farkas E, Wang XY, Oh SO, Hur JS. 2013. New and noteworthy lichen-forming and lichenicolous fungi. Acta Botanica Hungarica 55(3–4): 275–349. https://doi.org/10.1556/ABot.55.2013.3-4.9

Kondratyuk SY, Jeong MH, Yu NN, Kärnefelt I, Thell A, Elix JA, Kim JA, Kondratiuk AS, Hur JS. 2014a. A revised taxonomy for the subfamily *Caloplacoideae* (*Teloschistaceae*, *Ascomycota*) based on molecular phylogeny. Acta Botanica Hungarica 56: 93–123. https://doi.org/10.1556/ABot.56.2014.1-2.12

Kondratyuk SY, Kärnefelt I, Thell A, Elix JA, Kim JA, Jeong MH, Yu NN, Hur JS. 2014b. A revised taxonomy for the subfamily *Xanthorioideae* (*Teloschistaceae*, *Ascomycota*) based on molecular phylogeny. Acta Botanica Hungarica 56: 141–178. https://doi.org/10.1556/ABot.56.2014.1-2.12

Kondratyuk SY, Kärnefelt I, Thell A, Elix JA, Kim J, Kondratiuk AS, Hur JS. 2015a. *Tassiloa*, a new genus in the *Teloschistaceae* (lichenized *Ascomycetes*). Graphis Scripta 27(1–2): 22–26.

Kondratyuk SY, Lőkös L, Kim JA, Kondratiuk AS, Jeong MH, Jang SH, Oh SO, Hur JS. 2015b. Three new monotypic genera of the caloplacoid lichens (*Teloschistaceae*, lichen-forming *Ascomycetes*). Mycobiology 43: 195–202. https://doi.org/10.5941/MYCO.2015.43.3.195

Kondratyuk SY, Kärnefelt I, Thell A, Elix JA, Kim J, Kondratiuk AS, Hur JS. 2015c. *Brownlielloideae,* a new subfamily in the *Teloschistaceae* (*Lecanoromycetes*, *Ascomycota*). Acta Botanica Hungarica 57: 321–341. https://doi.org/10.1556/034.57.2015.3-4.6

Kondratyuk SY, Kim JA, Yu NH, Jeong MH, Jang SH, Kondratiuk AS, Zarei-Darki B, Hur JS. 2015d. *Zeroviella*, a new genus of xanthorioid lichens (*Teloschistaceae*, *Ascomycota*) proved by three gene phylogeny. Ukrainian Botanical Journal 72(6): 574–584. https://doi.org/10.15407/ukrbotj72.06.574

Søchting U, Søgaard MZ, Elix JA, Arup U, Elvebakk A, Sancho LG. 2014a. *Catenarina* (*Teloschistaceae*, *Ascomycotina*), a new southern hemisphere genus with 7-chlorocatenarin. Lichenologist 46: 175–187. https://doi.org/10.1017/S002428291300087X

Søchting U, Garrido-Benavent I, Seppelt R, Castello M, Pérez-Ortega S, De Los Ríos Murillo A, Sancho LG, Frödén P, Arup U. 2014b. *Charcotiana* and *Amundsenia*, two new genera in *Teloschistaceae* (lichenized *Ascomycota*, subfamily *Xanthorioideae*) hosting two new species from continental Antarctica, and *Austroplaca frigida*, a new name for a continental antarctic species. Lichenologist 46: 763–782. https://doi.org/10.1017/S0024282914000395

Thor G, Nascimbene J. 2010. An annotated checklist and bibliography of lichens and lichenicolous fungi of Libya. Cryptogamie, Mycologie 31: 67–95.

Wetmore CM. 1994. The lichen genus *Caloplaca* in North and Central America with brown or black apothecia. Mycologia 86: 813–838. https://doi.org/10.2307/3760596

Wilk K. 2011. New or noteworthy records of *Caloplaca* (*Teloschistaceae*) from Poland. Mycotaxon 115: 83–98. https://doi.org/10.5248/115.83